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DIET AND REPRODUCTIVE CONDITION OF FREE-RANGING *VARANUS TIMORENSIS*

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ABSTRACT

The stomach contents and gonads of *Varanus timorensis* collected during two periods, May and September-October, were examined. The stomach contents consisted of invertebrates and geckoes. Gonadal condition indicated that breeding occurred during the dry season.

INTRODUCTION

Varanus timorensis is found only on Timor, Roti, Savu and Semau Islands in eastern Indonesia. The species was described by Gray (1831), and subsequently placed in the subgenus *Odatria* (Gray 1838). Most work on the species since then has been taxonomic (Mertens 1959, Branch 1982). The only published information on the ecology of free-living animals of this species is contained in Schmutz and Horn (1986) and Losos and Greene (1986). Data on keeping and captive breeding of *V. timorensis* are presented by Behrmann (1981), DeBitter (1981) and Eidenmuller (1986).

Data on the stomach contents and reproductive condition of wild-captured specimens of *V. timorensis* are presented here.

MATERIALS AND METHODS

Specimens (n=47) were purchased from villagers on Timor, Roti, Savu and Semau Islands by staff of the Western Australian Museum and Museum Zoologicum Bogoriense. The specimens were collected

under licence from the Indonesian government. Four expeditions were made to those islands. The dates and number of specimens obtained were from 15-21 May 1989 (n=3), on 30 May 1990 (n=1) and from 27 September-27 October 1990 (n=32) and from 3-7 May 1991 (n=11).

Snout-vent lengths (SVL) of all specimens were measured with calipers and some specimens were weighed in the field to the nearest 0.5 g with a spring balance prior to fixation in formalin.

In the laboratory in Perth, a ventral incision was made and the stomach contents were removed. Prey items were measured against an oblong template and each was assigned to a target size class (Webb *et al* 1982) . The smallest target size for prey (1) was 2.5 mm^2 or less, and each successive target size doubled in both dimensions, and thus increased in area by a factor of four. The length and width of testes and ovaries, and the diameter of the largest ovarian follicle, were measured with vernier calipers.

RESULTS

Size range

Snout-vent lengths of adult males ranged from 138 - 250 mm, with a mean value of 193.1±5.6 mm (n=27), and weights ranged from 41 - 290 g (n=15). The SVLs of females ranged from 157 - 235 mm, with a mean value of 181.1±3.9 mm (n=19), and the weights ranged from 32.5 - 151 g (n=8). The adult specimens (of both sexes) with the smallest and the largest SVLs were used in the calculations of maximum and minimum weights. The one juvenile had a SVL of 68 mm, a total length of 158 mm and weighed 3.8 g. It was collected on 23 October 1990.

Stomach contents

The stomachs of 25 of the 47 specimens examined were empty (24) or missing (1). Contents of the remaining 22 stomachs were mainly invertebrates, particularly orthopterans and spiders (Table 1). The only vertebrates found were two geckoes (*Hemidactylus frenatus*). Three stomachs contained only plant fragments, which were probably ingested while swallowing prey. Most stomachs (n=16) contained only 1 item, 5 stomachs contained 2 items (2 spiders in 1, different prey items in 4, including 1 vertebrate-a gecko- and 1 invertebrate-a cockroach- in 1 stomach) and 1 stomach contained 4 items (3 larvae, 1 mantid). Many prey items were fragmented and or partially digested, so precise measurements of their size or volume could not be made.

Of the prey items in stomachs, 13 of 27 were in target size class 3 (area up to 40 mm^2). There was no correlation of prey size and predator size. The smallest and the largest adult *V. timorensis* in the sample

were amongst those that had eaten prey in size class 3. Both geckoes were in target size class 4

Reproduction

Testis dimensions (mean length x width) of males collected during May were significantly larger ($t=8.285$, $df=25$, $p<0.0001$) than those of males collected in September-October (Table 2). The dimensions (mean length x width) of the ovaries and the mean diameters of the largest ovarian follicles were significantly greater ($t=5.575$, $df=16$, $p<0.001$) in females collected in May than those of females collected in September - October (Table 2). No females with oviducal eggs were found.

Although males were more abundant in the sample than females (29:19), the sex ratio was not significantly different from 1:1 ($X^2=1.053$, $p>0.05$).

DISCUSSION

The SVL's of males were not significantly larger than those of females.

The stomach contents of *V. timorensis* were similar to those of most species of small varanids from northern Australia in that the majority of items are from a wide range of invertebrate taxa, and the few vertebrates which occur constitute a large proportion of the prey mass (Pianka 1986; Losos and Greene 1988; Jamesl *et al.*, 1992). The expectation by Schmutz and Horn (1986) that skinks and not geckoes would be eaten by *V. timorensis* was not supported by the data obtained in this study, as both lizards which had been eaten were geckoes (Table 1). However, their view that small snakes would be included in the diet (Schmutz and Horn 1986) was confirmed by Losos and Greene (1986) who found a snake in the specimen of *V.*

Table 1. Stomach contents of 46 *V. timorensis*

Prey	No. of stomachs	% stomachs
Empty	24	52.2
Grasshoppers	6	13.0
Spiders	3	6.5
Scorpions	2	4.3
Roaches	2	4.3
Geckos	2	4.3
Larva	1	2.2
Mantid	1	2.2
Bee	1	2.2
Unidentified	3	6.5
Plant fragments	3	6.5

timorensis they examined. The prediction that locusts and grasshoppers would be likely prey species (Schmutz and Horn 1986) was correct (Table 1).

The bias towards males in this species is similar to the male bias in sex ratios in museum collections of many species of varanids (King and Rhodes 1982). This may be a result of greater activity levels in males (Auffenberg 1979).

The testes and the ovaries and ovarian follicles of the animals collected in May were larger than those collected in September and October. The monsoons in Timor are variable in duration, but the dry season there usually begins in April (Schmutz and Horn 1986). These data suggest that *V. timorensis* breeds early in the dry season. The timing of reproductive activity of varanids in northern Australia is highly variable, with some species breeding during the wet season (Shine 1986) and others at different times during the dry season (Shine 1986; James *et al.*, 1992; King *et al.*, unpublished).

DeBitter (1981) reported that copulation of *V. timorensis* occurred approximately 6 weeks before egglaying and that incubation took 119-124 days. Eidenmuller (1986) reported an incubation period of 119-126 days at 28± 1°C, which is slightly higher than the mean air temperatures on Timor from May to September. Similar sized Australian varanids have incubation periods of approximately the same length as *V. timorensis* (Horn and Visser 1989). Incubation times would be shorter at a higher temperatures.

A small male (total length=158 mm) which was captured on 23 October 1990 was similar in size to the total lengths (140 to 152 mm) of 2 *V. timorensis* hatchlings reported by Behrmann (1981) and the 163 to 174 mm (mean=169 mm) of 4 hatchlings reported by (Eidenmuller 1986). Young varanids grow very rapidly and the mean total length of the hatchlings reared by Eidenmuller (1986) 16 to 23 days after hatching had increased to 196 mm. Assuming that incubation times and growth rates in the field are similar to those in captivity, this indicates that the egg from which the small male hatched was laid in early June.

Table 2. Mean (±SE) SVL and gonad size, in mm, of 46 *Varanus timorensis*

a. Males

Month of collection	n	SVL	Testis length x Testis width
May	10	185.1±6.1	118.7±30.8
Sept.-Oct.	17	196.0±7.9	48.6±13.0

b. Females

Month of collection	n	SVL	Ovary length x Ovary width	Diam. of largest follicle
May	5	180.6±3.9	111.3±31.9	4.6±0.5
Sept.-Oct.	14	181.3±5.1	39.2±21.3	2.3±0.9

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